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GROUNDWATER DEVELOPMENT
FOR THE
BOROUGH OF EAST STROUDSBURG

For

BOROUGH OF EAST STROUDSBURG
EAST STROUDSBURG, PENNSYLVANIA

By

MOODY AND ASSOCIATES, INC.

Offices at

1361 Conneaut Lake Road Meadville, Pa. 16335 (814) 336-1128	&	4099 Derry Street Harrisburg, Pa. 17111 (717) 564-6770

June 1971

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GROUNDWATER DEVELOPMENT FOR THE BOROUGH OF EAST STROUDSBURG

INTRODUCTION

Moody and Associates, Inc. is pleased to present this report covering that work performed in evaluating the groundwater development potential for the Borough.

Initial studies were performed to establish the groundwater development potential based upon an analysis of surface features, aerial photographs, and past published information. The results of this study were set forth in our report dated January 13, 1970. As a part of this study, optimum test well sites were selected within three general areas within the Borough, and recommendations were made to authorize the aquifer testing at several of these sites.

By your letter of authorization dated April 9, 1970, approval was given to execute that work associated with the aquifer testing at two sites located within the confines of East Stroudsburg State College, and although these sites were not at the top of the priority list, specific needs associated with the low pressure zone in this part of the distribution system justified the authorization of initial aquifer testing in the college area.

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REVIEW OF GENERAL GEOLOGIC SETTING

The general geology within the study area was set forth on Figures 1 and 2 of our original report which now becomes Appendix I to this report and should be included within this report binder.

As shown on Figures 1 and 2 of Appendix I, the college property is seen to be located near the axis of a broad anticline which exposes the Buttermilk Falls limestone formation to the ground surface within the area of the college where aquifer tests were performed.

RESULTS OF TEST WELL DRILLING

The location of Test Wells 1 and 2 is shown on Figure 1. Both test wells were located to penetrate the Buttermilk Falls limestone at the locus of two intersecting earth fracture zones.

The geologic analysis of samples of cuttings obtained from the drilling of the test wells indicate that the wells in fact penetrated the Buttermilk Falls Formation, the underlying Schoharie and Esopus shales, and a very thin section of Oriskany Formation which was encountered at 672 feet in Test Well 1.

Test Well 1

This aquifer test penetration was advanced to a total depth of 720 feet at which time a total of 300 gpm (gallons per minute) of water was being blown from the test well. The quality of the water insofar as its iron, hardness, and pH are concerned was 0.4 ppm (parts per million), 137 ppm, and 8.0 respectively. The test well log, well construction, and approximate quantity of water blown from the well during its test drilling are shown on Figure 2. Based upon the quantity of water blown at each encounter of water in proportion to the total blown effluent upon completion of the well, it was established that the available drawdown (the distance from the static water level to the depth of major water encounter) was significantly high, and this in conjunction with the large quantity of water blown justified the recommendation to establish a second aquifer test location which hopefully would provide enough water to provide substance for the development of a second well, but which would also provide the necessary observation point for detailed hydrology studies to be conducted in Well 1.

Test Well 2

Authorization for Test Well 2 was given, and following the test drilling of this well to a total depth of 705 feet, the total quantity of 150 gpm was being blown from the well. The water quality, as established during the drilling process, was 0.6 ppm total iron, 188 ppm hardness, and pH of 8.0. The drilling log, well construction and approximate quantity of water blown at each encounter of water is shown on Figure 3.

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HYDROLOGY STUDIES

To establish the safe yield, to collect samples for chemical analysis, and to provide information pertinent to areal drawdown and long-term well reliability, hydrology studies were conducted by performing controlled pumping tests in each well while monitoring the response of the groundwater table to this pumping in the other unpumped well.

Test Well 1

Preliminary Pumping -- A preliminary pumping test was conducted in Test Well 1 in conjunction with a step-drawdown test to establish the anticipated well efficiency and the specific capacity at incrementally increased rates to enable a decision on the optimum long-term rate at which to conduct the controlled test, and to gradually remove remnant residual materials from the fracture system encountered in the well bore. The step-drawdown test is shown on Figure 4 which indicated that the potential of the well was greater than the rate at which it could be pumped by means of the submersible test pump, but also that the well was quite inefficient and that large drawdown was created in response to pumping, especially at higher rates. The step-drawdown test was terminated after 300 minutes, and a 170-gpm rate was maintained throughout the remainder of the test.

Based upon an analysis of this data presented on Figure 4, and the fact that very little drawdown was created in the observation point at

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Test Well 2 (shown at the top of Figure 4), it was considered advisable to recommend that the diameter of Test Well 1 be enlarged to 11 inches from the nominal 8-inch diameter test bore. Indications were that the initial test well was quite inefficient, and case history experience indicates that the specific capacity $\left(\frac{\text{Capacity, Q, in gpm}}{\text{Drawdown, s, in feet}}\right)$ on a short-term basis, and hence the peak-load pumping rate, can commonly be increased in such cases by enlarging the well bore.

Tabulated below is a comparison of the specific capacity increase resulting from the reaming operation.

East Stroudsburg T. W. #1

Time (t) in minutes	8" Test Well Q	s	$\frac{Q}{s}$	After Reaming to 11" Q	s	$\frac{Q}{s}$	% Improvement
60	50	18	2.78	50	17	2.94	5.8
120	100	46	2.17	100	34	2.92	33.5
180	150	70	2.14	150	67	2.24	4.8
300	170	104	1.63	200	114	1.75	7.4 *

Final Test Pumping -- Following the reaming and the repetition of the step-drawdown test, a final pumping test was conducted. The results of this pumping are plotted on Figure 5 for analysis and evaluation. On the basis of this information, we consider it conservative to recommend that this well can be pumped at the rate of 200 gpm for an indefinite period of time as indicated by the small Δs value (change in drawdown over a log cycle) established during the last 1, 000 minutes of pumping.

* Conservative comparison as after reaming pumping rate and associated velocity losses were higher.

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The positive change in slope of the drawdown curve after t = 3000 minutes indicates a recharging boundary condition, and in reality, recharge was apparently equaling the discharge rate at the time the pumping test was stopped. Therefore, by using a Δs value of 5 for design, inherent conservatism is included in establishing the well yield.

However, on the basis of this negative slope, it is considered that after one year of continuous pumping at 200 gpm, a drawdown of 209 feet, or a pumping level of 298 feet should result. Since available drawdown is computed at 478 feet for this well, the recovery curve indicates that the pumping rate was less than the volume of water available within the aquifer system, little areal drawdown was observed in Test Well 2, and a stabilizing trend was also shown in this well, it is considered practical to expect that a larger volume of water can be extracted on a continuous pumpage basis.

In this regard, we have evaluated the efficiency of the well as established from the step-drawdown test and consider that if the well were pumped at a rate of 250 gpm (360,000 gpd) a pumping level of 350 feet should result after a 1-year pumping period, and the available drawdown remaining at this point would still be 217 feet, which is considered more than adequate.

If we consider the same theoretical computations, for a 300-gpm pumping rate it is possible that a drawdown of 330 feet would result for the 300-gpm pumping rate, leaving an available drawdown of 148 feet after a 1-year pumping period.

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Our case history experience, however, indicates that together with the observed drawdowns and the step-drawdown test conducted at rates up to 300 gpm, we should not be so theoretically optimistic, since there is an apparent critical pumping rate for each rock well which when exceeded causes total drawdown within the well as a result of extreme velocity losses by water trying to enter the well through the small discontinuities constituting the fracture zone and the aquifer system.

We therefore must restrict the design pumping rate for this well to 250 gpm and anticipate that a design pumping level of 350 feet should result. Since the well was reamed to 11 inches in diameter to a depth of 693 feet, and the theoretical possibility exists that a rate in excess of 250 gpm could prevail, especially if increased efficiency results in response to longevity of pumping, it may be desirable to spend additional dollars for a higher capacity pump which would be set at a depth perhaps in excess of 500 feet. This decision, however, is one which must be made by your consulting engineer.

Test Well 2

Following the drilling and development of Test Well 2, pumping studies were performed for a 72-hour period while monitoring the response of water levels to this pumping in Test Well 1. The results of this pumping have been plotted for analysis and evaluation on Figure 6.

Based upon an analysis of Figure 6, it is considered advisable to recommend that Test Well 2 be pumped at a rate of 105 gpm. This rate of production should result in a stabilized drawdown of approximately 190 feet, which of course will vary in response to the seasonal fluctuation of the water table. The available drawdown in this well is considered to be 220 feet; therefore, we do not consider it practical to expect or to recommend that pumping rates in excess of 105 gpm be imposed upon this well for periods longer than 8 hours. The areal drawdown effects of production on Test Well 2, as they would affect Test Well 1, are considered to be negligible; but the hydrologic interconnection of the two wells is readily apparent when considering the immediate response of water levels in the observation well (Well 1) to pumping in Well 2.

220
69
279

AREAL DRAWDOWN

The effects of groundwater production at rates of 200 gpm in Test Well 1 and 105 gpm in Test Well 2 as monitored from the pumping studies are plotted on Figure 7, indicating the drawdown at distance (r) away from the production well. In terms of these areal drawdown effects on surrounding wells, it is not considered that the production rates at which pumping tests were conducted could present serious problems to properly constructed surrounding wells within a radius of 1200 feet from Well 1 and 1000 feet from Well 2.

The areal drawdown computed to be created should production pumping be maintained at the test rates are computed to be 42 feet in Well 2 and 27 feet in Well 1. Since drawdown in the pumped wells was essentially stabilized at the end of pumping tests and observation wells had developed stabilizing trends, we anticipate that actual mutual interference at the end of one year will more closely approximate that observed during the 3-day pumping test.

WATER QUALITY

Appendix II contains the results of analyses made from the pump effluent following the preliminary pumping of Well 1 and for the final pumping of Well 1 after 72 hours of continuous pumping. Similarly, in the case of Well 2, analyses were made of samples collected following the 72-hour pumping test.

These analyses indicate that from a chemical standpoint, no treatment will be required. Water expectedly is seen to be hard, 160 and 202 ppm for Wells 1 and 2 respectively. The pH is likewise expectedly higher than your present surface water supply. The groundwater temperature was measured at 54° F. in both wells, and the temperature as well as the water quality should not vary significantly throughout each hydrologic year.

Samples collected for bacteriological analysis from both wells indicate that the water is completely potable without any treatment.

Health Department requirements, however, dictate that as a minimum, public water supplies must be subject to simple chlorination.

In addition, and as a result of concern regarding the compatibility of the new well supply with the treated surface water, we had an evaluation of the compatibility of the two waters performed by the Cyrus Wm. Rice Division, NUS Corporation.

Their letter report is attached as Appendix III. They could find no reason to question the compatibility of the two water supplies, and further felt that with proper blending and treatment a net positive effect to the East Stroudsburg water system could be realized.

RECOMMENDATIONS

As a result of the work conducted throughout the study period, beginning in October of 1969 and continuing through May of 1971, the following recommendations are made pertinent to the groundwater development program for the Borough of East Stroudsburg.

1. Test Well 1 should be equipped with a pump capable of a production of 200 gpm from an in-the-well head of 325 feet. The design option is provided that a peak-load pumping rate and possibly increased long-term rate could conceivably be increased to 250 to 300 gpm at which rates theoretical pumping levels are computed at 350 and 419 feet respectively. Consideration of the use of a variable speed turbine pump is therefore justifiable.

2. In the case of Well 2, we recommend that the well be equipped with a pump capable of a 105-gpm capacity against an in-the-well head of 300 feet. Should it be desirable to design for a peak-load pumping rate, it is considered practical to expect that a 150-gpm rate can be sustained by this well for a period of 8 hours per day. A pump setting of 460 feet should be considered for this peak-load pumping.
3. All pumps should be equipped with low water shut-off controls for their protection, especially if a peak-load pump design is to be adopted.
4. It is further recommended that each well placed into production be equipped with an accurate water level indicator and a totalizing flow meter. These devices can either be completely automatic recording instruments, or can be manually operated, read and recorded. In the case of the latter, accurate records should be kept on a weekly basis.

It is imperative in establishing the long-term optimum pumping rate for groundwater supplies that this rate be adjusted to be commensurate with the quantity of water available from the aquifer and within the hydraulic efficiency of the fracture system encountered in each well. Pumping rates recommended above, therefore, can be subject to increase or decrease based upon production history; however; we consider that the rec-

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ommendations made insofar as pumping rates are concerned are adequately conservative based upon the 72-hour pump test and our case history experiences in many consolidated rock aquifer wells.

5. Additional well sites were selected during the course of the study period, and the potential for high-capacity development of acceptable quality water exists at many places. We recommend that as additional water demands are created on the Borough's system, additional aquifer test sites be explored and developed. In this regard, consideration should be given immediately to the purchase option possibilities at this time due to rapidly escalating real estate costs.

We trust that the information in this report is adequately set forth in understandable terminology, and although every effort has been made to present data in this fashion, we would be happy to provide you with any backup information or additional clarification for any points which you might have.

AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS
CERTIFICATE NUMBER
1973
AIPG
RICHARD E. WRIGHT
PROFESSIONAL GEOLOGIST

Respectfully submitted,

MOODY AND ASSOCIATES, INC.

Richard E. Wright

Richard E. Wright, CPG
Manager, Harrisburg Office

REW:js

Figure 1

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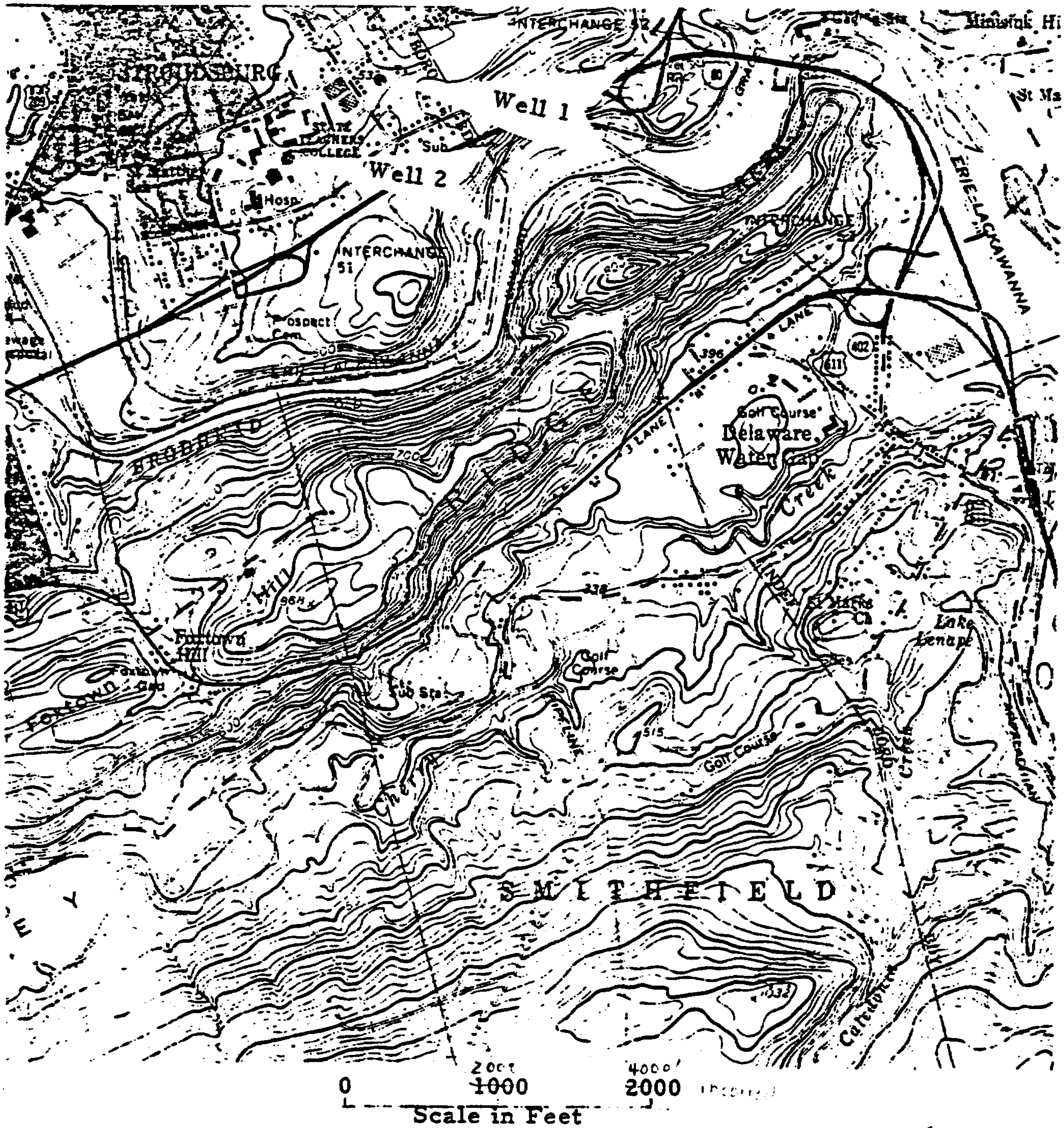
WELL LOCATION MAP*



* Base from Stroudsburg Quadrangle
7.5 min. series (topographic)

For:
BOROUGH OF EAST STROUDSBURG

East Stroudsburg, Pennsylvania

By:
MOODY AND ASSOCIATES, INC.
Meadville * Harrisburg, Pa.
June 1971 REW

AR100015

Figure 2

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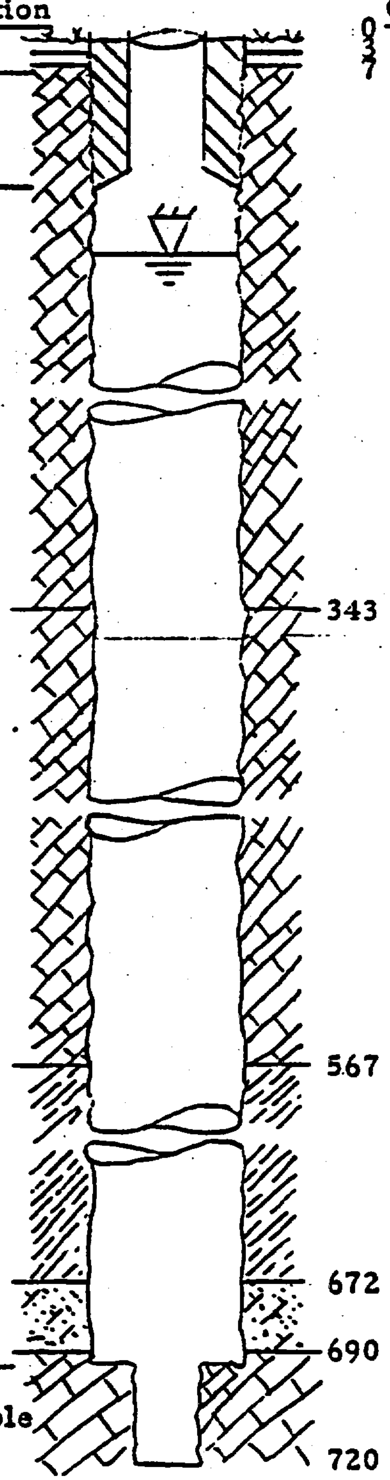
EAST STROUDSBURG

Well 1

Well Construction	Geologic Log	Water Quantity Blown
12" casing 9'	0 3 Top soil	
	7 Brown clay and boulders	
8" casing		
38'6"		
11" open hole	Static Water Level -- 89'	
	Limestone, dark gray	
343	350 pumping level	
	Iron, 2.0 ppm; @ 396-411 Hardness, 137 ppm; pH, 8.0	40 gpm
	Limestone, dark gray to black	
567	Iron, 0.6 ppm; @ 567 Hardness, 137 ppm; pH, 8.0	100+ gpm
	Shale, dark gray to black	
	Iron, 0.4 ppm; @ 664-672 Hardness, 137 ppm; pH, 8.0	300 gpm
672		
	Sandstone, gray to white, limy	
693 / 690		
6" open hole	Limestone, dark gray to black	
720		



Vertical Scale 1" = 50'

For:
BOROUGH OF EAST STROUDSBURG

East Stroudsburg, Pennsylvania

By:
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Meadville * Harrisburg, Pa.
June 1971 REW

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Figure 3

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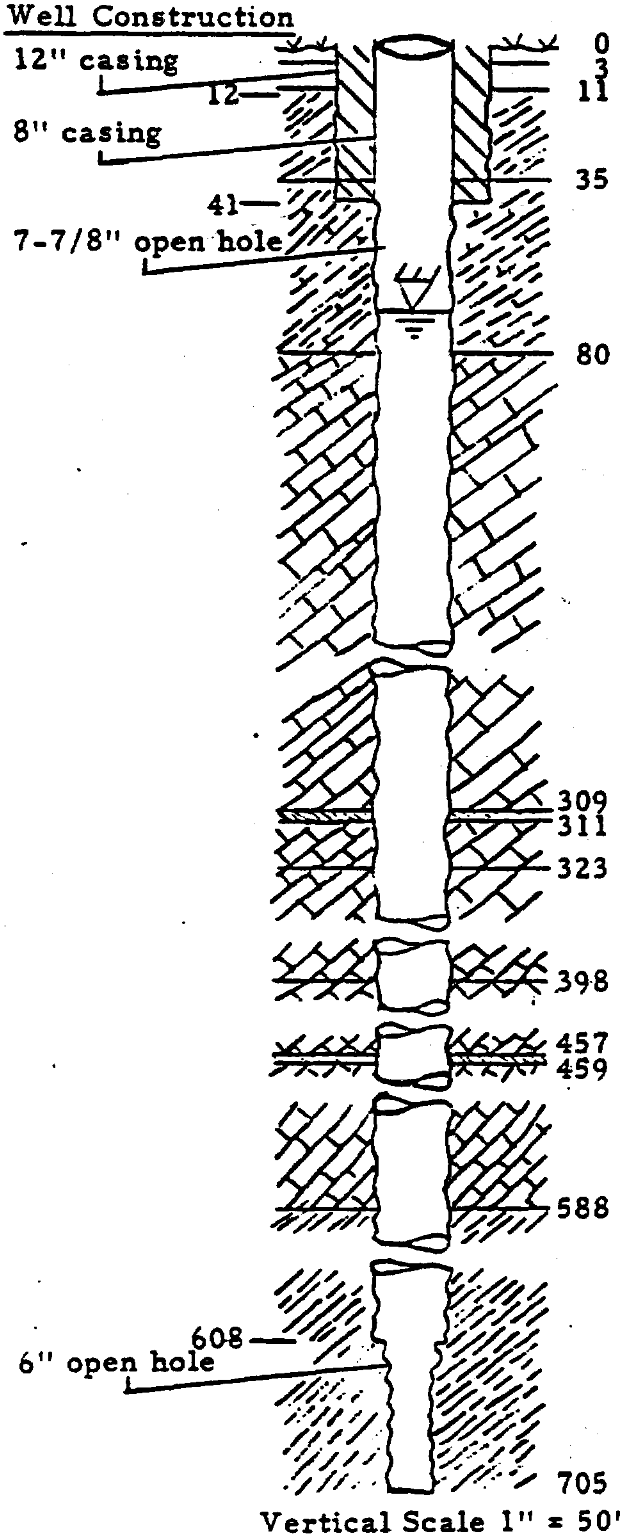
EAST STROUDSBURG

Well 2



Geologic Log — ground elev ~525' MSL

Water Quantity Blown

Top Soil (0–3)

Brown clay (3–11)

Shale--dark gray (11–35)

casing ~480'

Shale--dark gray, limy (35–80)

Static Water Level -- 69'

@ 134' 5 gpm

Limestone, dark gray (80–309)

@ 309' 60 gpm

Fractured zone, contained oxidized sand, silt and clay (309–311)

Limestone, gray (311–323)

Limestone, dark gray (323–398)

Limestone, dark gray to black (398–457)

Mud seam, soft brown silt and clay (457–459) 90 gpm

Limestone, dark gray (459–588)

Shale, dark gray to black (588–705)

Iron, 0.6 ppm; Hardness, 188 ppm; pH, 8.0 @ 617' 150 gpm

-185' MSL

For:
BOROUGH OF EAST STROUDSBURG

East Stroudsburg, Pennsylvania

By:
MOODY AND ASSOCIATES, INC.
Meadville * Harrisburg, Pa.
June 1971 REW

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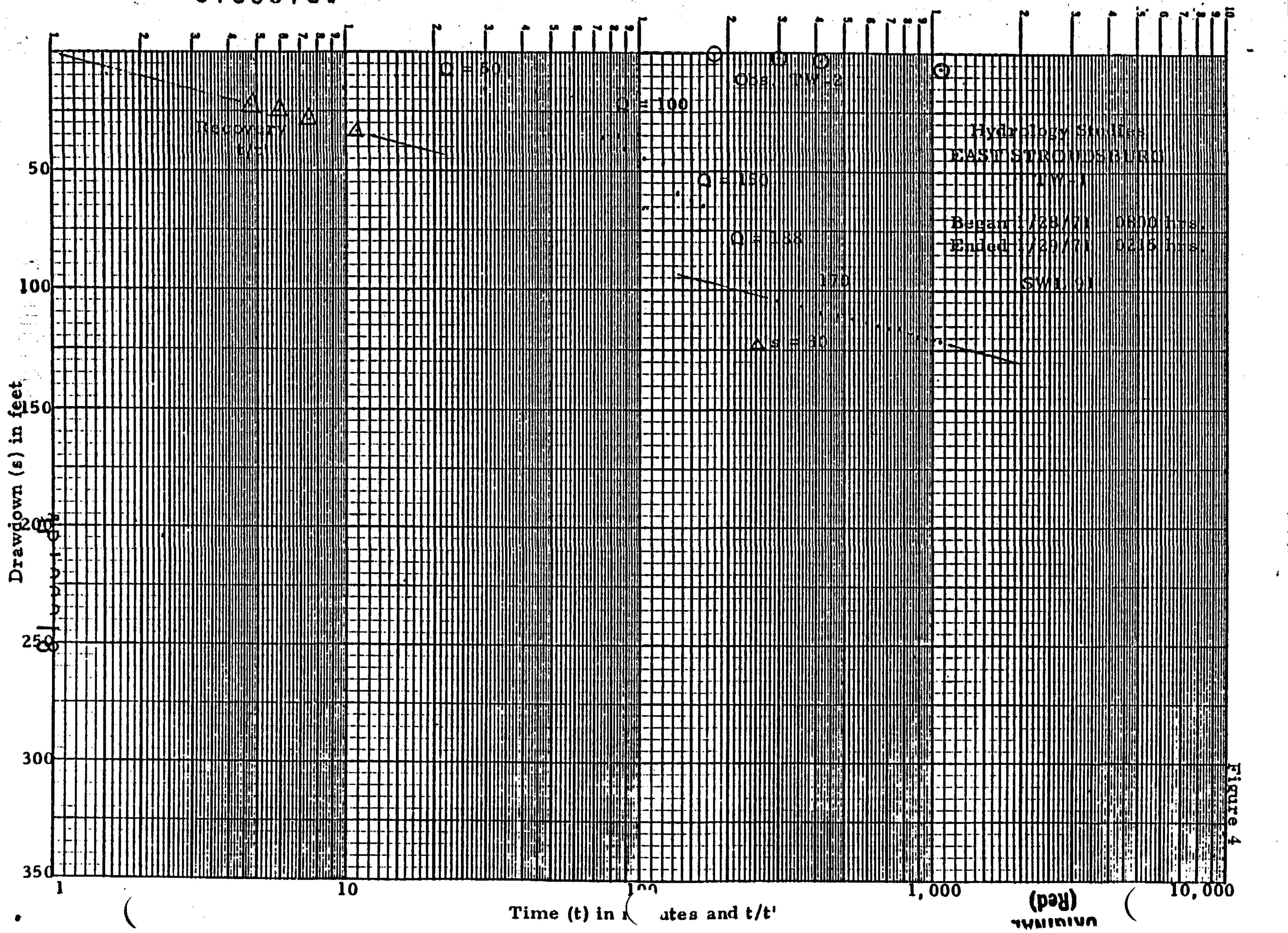

K+E SEMI-LOGARITHMIC 46 6013
4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
Figure 4
Hydrology Studies
EAST STROUDSBURG
TW-1
Began 1/28/71 0800 hrs.
Ended 1/29/71 0215 hrs.
SWL 91
Obs. TW-2
Q = 80
Q = 100
Q = 150
Q = 168
170
Δs = 80
Recovery
t/t'
Drawdown (s) in feet
Time (t) in minutes and t/t'

K+E SEMI-LOGARITHMIC 46 6013
4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.

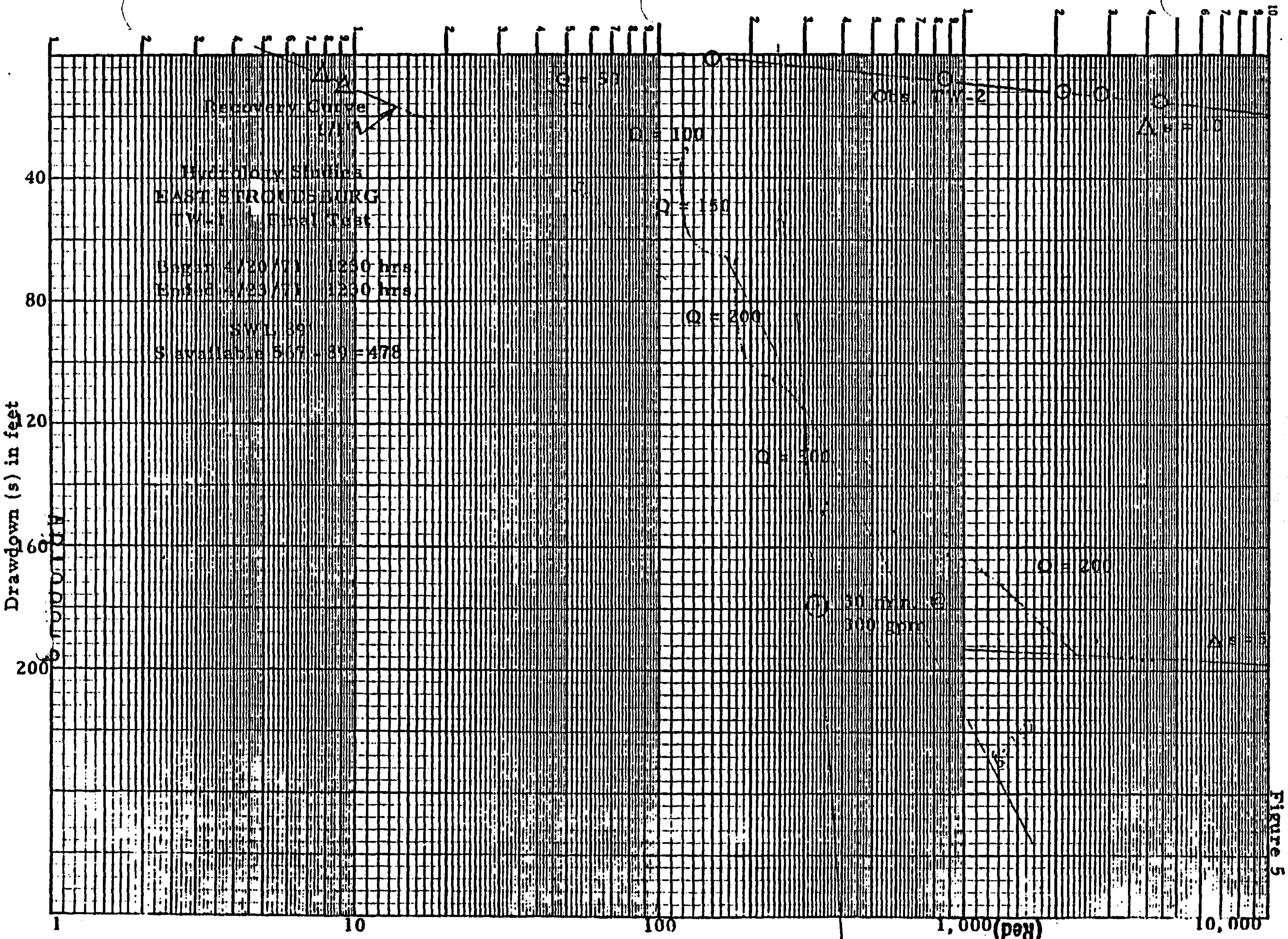

Figure 5

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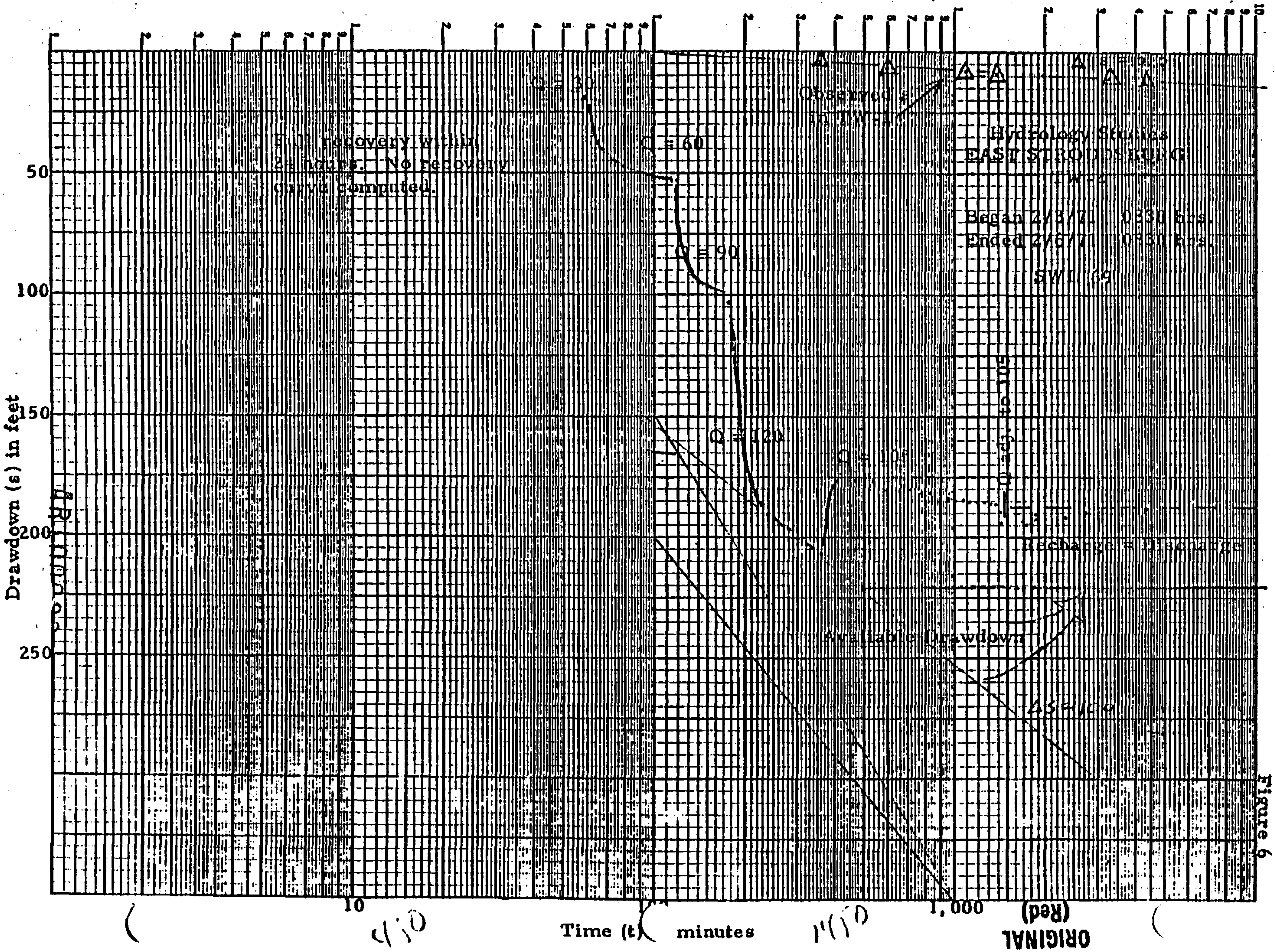
AR100020 K&E SEMI-LOGARITHMIC 4 CYCLES X 70 DIVISIONS 46 6013 KEUFFEL & ESSER CO.



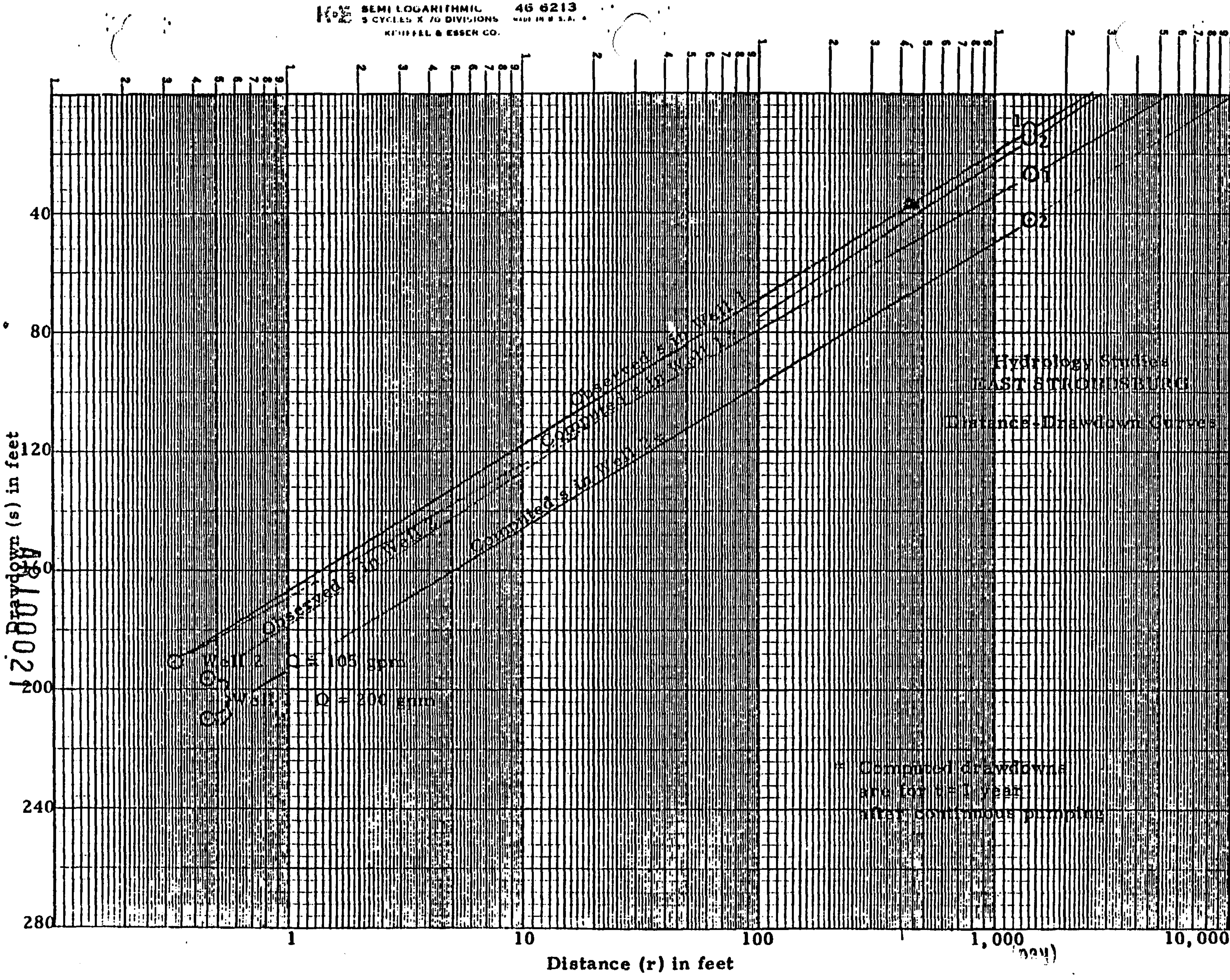


Figure 7

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APPENDIX I

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Test Well Drilling – Technical Reports

January 13, 1970

Borough of East Stroudsburg
East Stroudsburg, Pennsylvania 18301

Re: Ground-Water Development Potential,
Borough of East Stroudsburg,
Monroe County, Pennsylvania

Gentlemen:

We are pleased to present this report covering our evaluation of the ground-water development potential of the East Stroudsburg area (Phase I), as outlined in our proposal dated July 25, 1969. Acceptance and authorization to proceed was given by letter dated October 9, 1969 by Mr. Donald C. Gage.

Ground-Water Development Potential

It is concluded that the necessary geologic and hydrologic conditions exist in the East Stroudsburg area to permit the scientific development of a ground-water supply of sufficient quantity, quality and reliability to economically satisfy municipal demands, and be compatible with the existing system.

Potentially high-capacity aquifer test areas have been selected as shown on Figure 1. Based upon our Phase I studies, all of these areas

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appear to afford the opportunity for the development of from 175 to 250 gallons per minute (gpm) per well.

The sand and gravel deposits (glacial in origin) in the Brodhead Creek valley and two of the bedrock formations present in the area are worthy of consideration for the drilling of high-capacity wells at this time.

Unconsolidated aquifer potential -- The sand and gravel deposits in the Brodhead Creek valley, as determined by exposures and levee borings, consist primarily of a medium- to coarse-textured gravel, which is somewhat sandy to silty. These deposits are in excess of 35 feet thick and become finer textured with depth. Proven well development techniques, designed to remove fine sand and silt and maximize formation permeability, together with the design and installation of efficient well screens, will almost certainly result in the development of high-capacity wells. The potential for high-capacity wells in this area is enhanced because underlying these sand and gravel deposits are expectedly prolific consolidated rock aquifers which exist in the form of fracture zones in the limestone bedrock.

Consolidated rock aquifer potential -- The bedrock strata which have the potential for high-capacity aquifer test locations are the limestones of the Buttermilk Falls Formation and the sandstones of the Catskill Formation (Devonian in age). The limestones comprise the upland east of East Stroudsburg and are of sufficient thickness and permeability to be productive aquifers near the southern edge of the upland in the vicinity of Brown

Street. Dissection of the upland and thinning of the limestones by erosion has occurred throughout most of the remainder of the upland area. In addition, the anticlinal (upwarp) structure (refer to Figure 2) beneath this upland has resulted in less permeable, and therefore less productive strata being present at a shallow depth.

Pronounced fracture traces, which represent areas of joint (fracture) concentration in the bedrock, were observed on aerial photographs of the area. The fracture traces are observed as tonal alignments on the aerial photographs and their orientation corresponds closely to the joint measurements obtained on rock outcrops. Although drilling problems are created by the broken and weathered rock in these areas, they are the major avenues of ground-water movement in which high-yield wells can be developed.

In limestone (carbonate-rich) rocks, these fracture traces are commonly the loci of the chemical solution of the rocks by ground water. Although numerous exposures of these limestones indicated an absence of solution features in the rock, intense fracturing was observed. It is concluded that near-surface solution features were removed by glacial erosion, but that solution effects associated with glacial water table lowering should be encountered with depth and would provide additional high-volume flow paths for ground-water movement.

At this time, it is not considered feasible to locate any test well sites in the sandstones of the Catskill Formation which underlie the northern half of the East Stroudsburg reservoir. In addition to an expected lower yield per individual well drilled in the area, the evaporation losses of any ground water placed into the surface reservoir and the necessity of additional transmission lines to handle the increased volume of water provide substance for suggesting that immediate ground-water development efforts be directed elsewhere.

Although additional fracture-trace intersections and therefore potential high-capacity well sites exist throughout the area studied, those test areas shown on Figure 1 and discussed below have been selected as offering optimum hydrogeologic potential for integration into the existing water supply system.

Selection of Aquifer Test Locations

Two aquifer test locations are shown on Figure 1 which have a potential for the development of ground water in a well field composed of two or more wells. These areas are indicated by the double triangles. Two other single test well locations are also shown, and are indicated by the single triangle. These test areas have all been chosen on a basis of their potential to maximize water quantity, quality, and reliability for ground-water development and management within the study area. Each area contains the intersection of at least two fracture traces to maximize the probability of the successful development of a high-capacity well or wells.

Chemical analyses of several ground-water samples taken in the course of this study indicate that an increase in hardness and a higher pH can be expected from ground-water development in those test areas outlined. This increase will not present a problem of incompatability with ground-water integration into the surface water system, but, in fact, should enhance the water quality which is presently reported as "aggressive."

The aquifer test locations are numbered on the basis of their priority. The most promising area for ground-water development is located at the northwest corner of the intersection of Brown and Smith streets, on or adjacent to property of the East Stroudsburg State Teachers College. This area is underlain by the greatest thickness of limestones. In addition, the intersection of numerous fracture traces through this area makes it very promising for well field development.

Another area with high potential for ground-water development via a well field is located near the confluence of Sambo Creek and Brodhead Creek. Wells drilled at this location would take advantage of the permeable sand and gravel deposits and also the permeable limestone bedrock which underlies them. High-volume ground-water underflow is expected to be present in both the gravel deposits and the consolidated rock aquifers at this location.

Two other single test well locations are shown on Figure 1, one at the swimming pool property and the other east of the Borough line and north of Brown Street.

Recommendations

In order to definitely establish the quantity, quality, and expected reliability of the ground-water resources at these test areas, it will be necessary to perform scientific subsurface studies which will include test drilling, preliminary aquifer development, test pumping and analysis of pump test data. It is recommended, therefore, that authorization be given to proceed with the subsurface studies as outlined in Phase II of our July 25 proposal at each of the well field sites mentioned above.

Completion of the recommended Phase II work will enable you to prudently apply for ground-water usage from the Delaware River Basin Commission and test wells can then be converted to production wells in accord with future system demands.

Prior to this aquifer testing program, it will be necessary for us to stake well locations in the field in order that purchase option agreements can be obtained for the test drilling. It is recommended that a meeting be held with us to establish those aquifer test sites offering maximum utility and economy for your immediate and long-range planning and design needs.

Submission of this report is considered by us to constitute the completion of all work which we were authorized to perform. If you have any

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questions regarding the contents of this report, or if you should require additional discussion, please do not hesitate to call.

Respectfully submitted,

MOODY AND ASSOCIATES, INC.

Ronald A. Landon

Ronald A. Landon
Ground-Water Geologist

Richard E. Wright

Richard E. Wright, CPG
Manager, Harrisburg Office

AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS
CERTIFICATE NUMBER
1973
AIPG
RICHARD E. WRIGHT
CERTIFIED PROFESSIONAL GEOLOGIST

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cc: E. C. Hess Associates

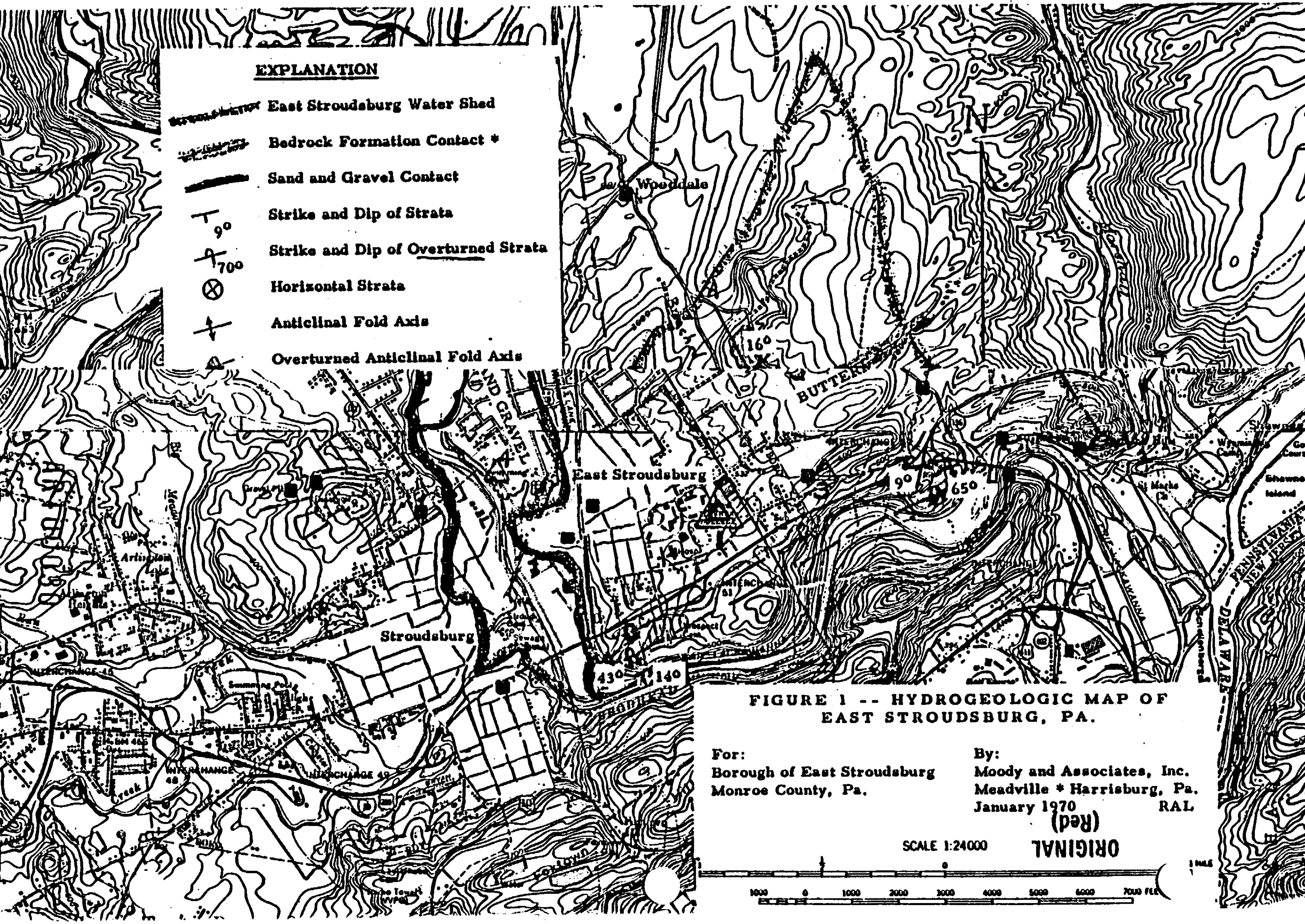
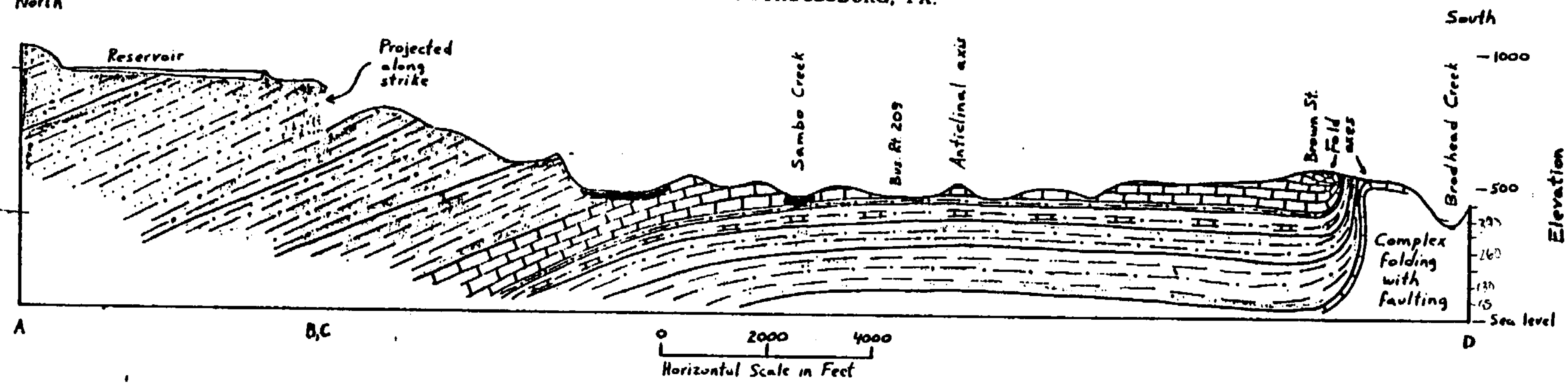


FIGURE 1 -- HYDROGEOLOGIC MAP OF EAST STROUDSBURG, PA.

For:
Borough of East Stroudsburg
Monroe County, Pa.

By:
Moody and Associates, Inc.
Meadville * Harrisburg, Pa.
January 1970 RAL

FIGURE 2 -- GEOLOGIC CROSS SECTION OF EAST STROUDSBURG, PA.



EXPLANATION

- Catskill Formation
- Trimmers Rock, Brallier, Mahantango, and Marcellus Formations
- Buttermilk Falls Formation
- Schoharie and Esopus Formations

- Limestone
- Sandstone
- Siltstone
- Shale
- Sand and gravel

For:
Borough of East Stroudsburg
Monroe County, Pa.

By:
Moody and Associates, Inc.
Meadville * Harrisburg, Pa.
January 1970 RAL

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APPENDIX II

GWIN, DOBSON & FOREMAN, INC.

Consulting Engineers

EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1585
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-5214
943-5215

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FILE NO. C-364

PENNSYLVANIA DEPARTMENT OF HEALTH CERTIFICATION NO. IV-9-8

REPORT OF CHEMICAL ANALYSIS

DATE April 27, 1971

SAMPLE OF Water
SAMPLING POINT Test Well #1
ADDRESS COLLECTED East Stroudsburg
BORO, CITY, TWP.
COLLECTED BY Moody Drilling Co.
DATE & TIME COLLECTED 4/23/71 10 A.M.
DATE ANALYZED 4/27/71
REMARKS

PHYSICAL RESULTS

Color		0	units
Turbidity		2.3	units

ALKALINITY RELATIONSHIPS

pH		7.8	
Total Alkalinity	(as $CaCO_3$)	128	ppm
Bicarbonate Alakalinity	(as $CaCO_3$)		ppm
Carbonate Alkalinity	(as $CaCO_3$)		ppm
Hydroxide Alkalinity	(as $CaCO_3$)		ppm
Acidity to pH4	(as $CaCO_3$)		ppm
Acidity to pH8 (Hot)	(as $CaCO_3$)	0	ppm

HARDNESS RELATIONSHIPS

Total Hardness EDTA	(as $CaCO_3$)	160.0	ppm
Calcium	(as $CaCO_3$)	47.3	ppm
Magnesium	(as $CaCO_3$)		ppm

ANIONS

Chloride	5.0	ppm
Fluoride		ppm
Cyanide		ppm
Sulfate	28.8	ppm

METALS

Aluminum		ppm
Chromium		ppm
Iron, Total	.02	ppm
Iron, Ferrous		ppm
Manganese	0.0	ppm

NITROGEN RELATIONSHIPS

Ammonia	(as N)		ppm
Nitrite	(as N)	.04	ppm
Nitrate	(as N)	0.41	ppm
Kjeldahl, Organic	(as N)		ppm

OXYGEN RELATIONSHIPS

Dissolved Oxygen		ppm
Biochemical Oxygen Demand		ppm
Chemical Oxygen Demand		ppm

SOLIDS RELATIONSHIPS

	Total	Fixed	Volatile
Total Solids	198 ppm	176 ppm	22 ppm
Suspended Solids	0 ppm	0 ppm	0 ppm
Dissolved Solids	ppm	ppm	ppm
Settleable Solid	ml/L		

ECIAL TESTS

Chlorine Residual		ppm
Chlorine Demand (30 minute, res. 0.5)		ppm
A. B. S.		ppm
Free Carbon Dioxide (as CO_2)		ppm

T. Heil [illegible]
Analyzed By

OTHERS

AR100033

GWIN, DOBSON & FOREMAN, INC.
Consulting Engineers
EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1589
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-5214
943-5215

ORIGINAL
(Red)

FILE NO. C-443

PENNSYLVANIA DEPARTMENT OF HEALTH
CERTIFICATION NO. IV-9-B

REPORT OF CHEMICAL ANALYSIS

DATE 2/11/70

SAMPLE OF Water
SAMPLING POINT Test Well #2
ADDRESS COLLECTED East Stroudsburg
BORO, CITY, TWP.
COLLECTED BY Moody Drilling Co.
DATE & TIME COLLECTED 2/6/71 8:30 A.M.
DATE ANALYZED 2/11/70
REMARKS

PHYSICAL RESULTS

Color	0	units
Turbidity	0	units

ALKALINITY RELATIONSHIPS

pH		7.7	
Total Alkalinity	(as $CaCO_3$)	162	ppm
Bicarbonate Alakalinity	(as $CaCO_3$)		ppm
Carbonate Alkalinity	(as $CaCO_3$)		ppm
Hydroxide Alkalinity	(as $CaCO_3$)		ppm
Acidity to pH4	(as $CaCO_3$)		ppm
Acidity to pH8 (Hot)	(as $CaCO_3$)	0	ppm

HARDNESS RELATIONSHIPS

Total Hardness EDTA	(as $CaCO_3$)	202	ppm
Calcium	(as $CaCO_3$)	70.5	ppm
Magnesium	(as $CaCO_3$)		ppm

ANIONS

Chloride	9.5	ppm
Fluoride		ppm
Cyanide		ppm
Sulfate	38.4	ppm

METALS

Aluminum		ppm
Chromium		ppm
Iron, Total	0.0	ppm
Iron, Ferrous		ppm
Manganese	0.0	ppm

NITROGEN RELATIONSHIPS

Ammonia	(as N)	0.00	ppm
Nitrite	(as N)	0.04	ppm
Nitrate	(as N)	0.40	ppm
Kjeldahl, Organic	(as N)		ppm

OXYGEN RELATIONSHIPS

Dissolved Oxygen		ppm
Biochemical Oxygen Demand		ppm
Chemical Oxygen Demand		ppm

SOLIDS RELATIONSHIPS

	Total	Fixed	Volatile
Total Solids	276 ppm	230 ppm	46 ppm
Suspended Solids	0 ppm	0 ppm	0 ppm
Dissolved Solids	276 ppm	230 ppm	46 ppm
Settleable Solid	ml/L		

SPECIAL TESTS

Chlorine Residual		ppm
Chlorine Demand (30 minute, res. 0.5)		ppm
A. B. S.		ppm
Free Carbon Dioxide (as CO_2)		ppm

Charles F. Vrenna
Analyzed By

AR100034

GWIN, DOBSON & FOREMAN, INC.

Consulting Engineers

EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1555
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-8214
943-8215

ORIGINAL (Red)

PE[illegible]YLVANIA DEPARTMENT OF HEALTH
CERTIFICATION NO. IV-9-8

FILE NO. 7745
7746
7747

BACTERIOLOGICAL ANALYSIS
WATER REPORT

DATE 2-8-71

Moody Drilling Co.

	NO. 7745					NO. 7746					NO. 7747				
PLACES SAMPLES COLLECTED	East Stroudsburg					East Stroudsburg					East Stroudsburg				
POINT SAMPLES COLLECTED	Test Well #1					Test Well #1					Test Well #1				
DATE & HOUR SAMPLES COLLECTED	1/29 1:00P					1/29 1:15P					1/29 1:30P				
DATE & HOUR SAMPLES ANALYZED	2/8 1:00P					2/8 1:05P					2/8 1:10P				
DIRECT PLATING:															
QUANTITY ____ 0.1 ML.															
QUANTITY 1 1.0 ML.	0					0					0				
CHLORINE RESIDUAL (FIELD)	Raw					Raw					Raw				
pH															
TURBIDITY															
PRESUMPTIVE TEST:	TUBE NO.					TUBE NO.					TUBE NO.				
37° IN LACTOSE BROTH	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
QUANTITY 5 TUBES 0.1 ML. - 24 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY TUBES 0.1 ML. - 48 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY 5 TUBES 1.0 ML. - 24 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY TUBES 1.0 ML. - 48 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY 5 TUBES 10 ML. EA. - 24 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY TUBES 10 ML. EA. - 48 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONFIRMATORY BRILLIANT GREEN LACTOSE BILE BROTH, INCUBATE FOR 48 ± 3 HR. AT 35°C ± 0.5°															
COMPLETE CONFIRMATION: TYPICAL COLONIES TRANSPLATED FROM E. M. B. 37° — 48 HRS. IN BROTH.															
MEMBRANE FILTER 24 HRS. C 37° C ENDO MEDIUM															
VOLUME FILTERED															
TYPICAL COLONIES															

REMARKS ON SAMPLES: P P P

[illegible]IFORM ORGANISMS PER 100 ML.

	MULTIPLE TUBES		MEMBRANE FILTER
NO. — 1	0	MPN	
NO. — 2	0	MPN	
NO. — 3	0	MPN	

ANALYZED BY Charles F. Vrenna

AR100035

GWIN, DOBSON & FOREMAN, INC.

Consulting Engineers

EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1589
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-5214
943-5215

ORIGINAL (Red)

PENNSYLVANIA DEPARTMENT OF HEALTH
CERTIFICATION NO. IV-9-B

FILE NO. 7748
7749

BACTERIOLOGICAL ANALYSIS
WATER REPORT

DATE 2-8-71

Moody Drilling Co.

	NO. 7748	NO. 7749	NO.
PLACES SAMPLES COLLECTED	East Stroudsburg	East Stroudsburg	
POINT SAMPLES COLLECTED	Test Well #1	Test Well #1	
DATE & HOUR SAMPLES COLLECTED	1/29 1:45P	1/29 2:00P	
DATE & HOUR SAMPLES ANALYZED	2/8 1:15P	2/8 1:20P	
DIRECT PLATING:			
QUANTITY ____ 0.1 ML.			
QUANTITY 1 1.0 ML.	0	0	
CHLORINE RESIDUAL (FIELD)	Raw	Raw	
pH			
TURBIDITY			

PRESUMPTIVE TEST:	TUBE NO.					TUBE NO.					TUBE NO.				
37° IN LACTOSE BROTH	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
QUANTITY 5 TUBES 0.1 ML. - 24 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY TUBES 0.1 ML. - 48 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY 5 TUBES 1.0 ML. - 24 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY TUBES 1.0 ML. - 48 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY 5 TUBES 10 ML. EA. - 24 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY TUBES 10 ML. EA. - 48 HRS.	0	0	0	0	0	0	0	0	0	0					

CONFIRMATORY BRILLIANT GREEN LACTOSE BILE BROTH, INCUBATE FOR 48 ± 3 HR. AT 35°C ± 0.5°			
COMPLETE CONFIRMATION: TYPICAL COLONIES TRANSPLATED FROM E. M. B. 37° — 48 HRS. IN BROTH.			
MEMBRANE FILTER 24 HRS. C 37° C ENDO MEDIUM			
VOLUME FILTERED			
TYPICAL COLONIES			

REMARKS ON SAMPLES: P P

COLIFORM ORGANISMS PER 100 ML.

	MULTIPLE TUBES		MEMBRANE FILTER
NO. — 1	0	MPN	
NO. — 2	0	MPN	
NO. —		MPN	

AR100036

ANALYZED BY Charles F. Vrenna

GWIN, DOBSON & FOREMAN, INC.

Consulting Engineers

EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1555
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-5214
943-5215

ORIGINAL (Red)

FILE NO. C442

PENNSYLVANIA DEPARTMENT OF HEALTH
CERTIFICATION NO. IV-9-6

REPORT OF CHEMICAL ANALYSIS

DATE 2/8/71

SAMPLE OF Water
SAMPLING POINT Test Well #1
ADDRESS COLLECTED East Stroudsburg
BORO, CITY, TWP.
COLLECTED BY Moody Drilling Co.
DATE & TIME COLLECTED 1/29/71
DATE ANALYZED ~~XXX~~ 2/8/71
REMARKS

PHYSICAL RESULTS

Color	0	units
Turbidity	0	units

ALKALINITY RELATIONSHIPS

pH		7.5	
Total Alkalinity	(as $CaCO_3$)	152	ppm
Bicarbonate Alakalinity	(as $CaCO_3$)		ppm
Carbonate Alkalinity	(as $CaCO_3$)		ppm
Hydroxide Alkalinity	(as $CaCO_3$)		ppm
Acidity to pH4	(as $CaCO_3$)		ppm
Acidity to pH8 (Hot)	(as $CaCO_3$)	0	ppm

HARDNESS RELATIONSHIPS

Total Hardness EDTA	(as $CaCO_3$)	176	ppm
Calcium	(as $CaCO_3$)	52.1	ppm
Magnesium	(as $CaCO_3$)		ppm

ANIONS

Chloride	5.0	ppm
Fluoride		ppm
Cyanide		ppm
Sulfate	38.6	ppm

METALS

Aluminum		ppm
Chromium		ppm
Iron, Total	0.0	ppm
Iron, Ferrous		ppm
Manganese	0.0	ppm

NITROGEN RELATIONSHIPS

Ammonia	(as N)	0.00	ppm
Nitrite	(as N)	0.05	ppm
Nitrate	(as N)	0.59	ppm
Kjeldahl, Organic	(as N)		ppm

OXYGEN RELATIONSHIPS

Dissolved Oxygen		ppm
Biochemical Oxygen Demand		ppm
Chemical Oxygen Demand		ppm

SOLIDS RELATIONSHIPS

	Total	Fixed	Volatile
Total Solids	248 ppm	198 ppm	50 ppm
Suspended Solids	0 ppm	0 ppm	0 ppm
Dissolved Solids	248 ppm	198 ppm	50 ppm
Settleable Solid	ml/L		

SPECIAL TESTS

Chlorine Residual		ppm
Chlorine Demand (30 minute, res. 0.5)		ppm
A. B. S.		ppm
Free Carbon Dioxide (as CO_2)		ppm

AR100037

Charles F. Vrenna
Analyzed By

OTHERS

GWIN, DOBSON & FOREMAN, INC.

Consulting Engineers

EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1589
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-5214
943-5215

ORIGINAL

PENNSYLVANIA DEPARTMENT OF HEALTH
CERTIFICATION NO. IV-9-B

FILE NO. 7760
7761
7762

BACTERIOLOGICAL ANALYSIS
WATER REPORT

DATE 2-10-71

Moody Drilling Co.

	NO. 7760					NO. 7761					NO. 7762				
PLACES SAMPLES COLLECTED	East Stroudsburg					East Stroudsburg					East Stroudsburg				
POINT SAMPLES COLLECTED	Test Well #2					Test Well #2					Test Well #2				
DATE & HOUR SAMPLES COLLECTED	2/6 7:30 A					2/6 7:45A					2/6 8:00A				
DATE & HOUR SAMPLES ANALYZED	2/10 8:00P					2/10 3:05P					2/10 3:10P				
DIRECT PLATING:															
QUANTITY ____ 0.1 ML.															
QUANTITY 1 1.0 ML.	7					1					2				
CHLORINE RESIDUAL (FIELD)	Raw					Raw					Raw				
pH															
TURBIDITY															
PRESUMPTIVE TEST:	TUBE NO.					TUBE NO.					TUBE NO.				
37° IN LACTOSE BROTH	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
QUANTITY 5 TUBES 0.1 ML. - 24 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY TUBES 0.1 ML. - 48 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY 5 TUBES 1.0 ML. - 24 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY TUBES 1.0 ML. - 48 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY 5 TUBES 10 ML. EA. - 24 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUANTITY TUBES 10 ML. EA. - 48 HRS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CONFIRMATORY BRILLIANT GREEN LACTOSE BILE BROTH, INCUBATE FOR 48 ± 3 HR. AT 35°C ± 0.5°															
COMPLETE CONFIRMATION: TYPICAL COLONIES TRANSPLATED FROM E. M. B. 37° — 48 HRS. IN BROTH.															
MEMBRANE FILTER 24 HRS. C 37° C ENDO MEDIUM															
VOLUME FILTERED															
TYPICAL COLONIES															

REMARKS ON SAMPLES: P P P

COLIFORM ORGANISMS PER 100 ML.

	MULTIPLE TUBES		MEMBRANE FILTER
NO. — 1	0	MPN	
NO. — 2	0	MPN	
NO. — 3	0	MPN	

ANALYZED BY Charles F. Vrenna

AR100038

GWIN, DOBSON & FOREMAN, INC.

Consulting Engineers

EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1589
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-5214
943-5215

ORIGINAL (Red)

PENNSYLVANIA DEPARTMENT OF HEALTH
CERTIFICATION NO. IV-9-B

FILE NO. 7763
7764

BACTERIOLOGICAL ANALYSIS
WATER REPORT

DATE 2-10-71

Moody Drilling Co.

	NO. 7763					NO. 7764					NO.				
PLACES SAMPLES COLLECTED	East Stroudsburg					East Stroudsburg									
POINT SAMPLES COLLECTED	Test Well #2					Test Well #2									
DATE & HOUR SAMPLES COLLECTED	2/6 8:15A					2/6 8:30A									
DATE & HOUR SAMPLES ANALYZED	2/10 3:15P					2/10 3:20P									
DIRECT PLATING:															
QUANTITY ____ 0.1 ML.															
QUANTITY 1 1.0 ML.	0					0									
CHLORINE RESIDUAL (FIELD)	Raw					Raw									
pH															
TURBIDITY															
PRESUMPTIVE TEST:	TUBE NO.					TUBE NO.					TUBE NO.				
37° IN LACTOSE BROTH	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
QUANTITY 5 TUBES 0.1 ML. - 24 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY TUBES 0.1 ML. - 48 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY 5 TUBES 1.0 ML. - 24 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY TUBES 1.0 ML. - 48 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY 5 TUBES 10 ML. EA. - 24 HRS.	0	0	0	0	0	0	0	0	0	0					
QUANTITY TUBES 10 ML. EA. - 48 HRS.	0	0	0	0	0	0	0	0	0	0					
CONFIRMATORY BRILLIANT GREEN LACTOSE BILE BROTH, INCUBATE FOR 48 ± 3 HR. AT 35°C ± 0.5°															
COMPLETE CONFIRMATION: TYPICAL COLONIES TRANSPLATED FROM E. M. B. 37° — 48 HRS. IN BROTH.															
MEMBRANE FILTER 24 HRS. C 37° C ENDO MEDIUM															
VOLUME FILTERED															
TYPICAL COLONIES															

REMARKS ON SAMPLES: P P

COLIFORM ORGANISMS PER 100 ML.

	MULTIPLE TUBES		MEMBRANE FILTER
NO. — 1	0	MPN	
NO. — 2	0	MPN	
NO. —		MPN	

ANALYZED BY Charles F. Vrenna

AR100039

GWIN, DOBSON & FOREMAN, INC.

Consulting Engineers

EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1589
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-5214
943-5215

ORIGINAL (Red)

..NSYLVANIA DEPARTMENT OF HEALTH
CERTIFICATION NO. IV-9-B

FILE NO. 7952

BACTERIOLOGICAL ANALYSIS WATER REPORT

DATE 4-26-71

Moody Drilling Co.

	NO. 7952	NO. 7953	NO. 7954
PLACES SAMPLES COLLECTED	E. Stroudsburg, Pa.	E. Stroudsburg, Pa.	E. Stroudsburg, Pa.
POINT SAMPLES COLLECTED	Test Well #1	Test Well #1	Test Well #1
DATE & HOUR SAMPLES COLLECTED	4/23/71 11:30 A.M.	4/23/71 11:45 A.M.	4/23/71 12:00
DATE & HOUR SAMPLES ANALYZED	4/26/71 9:00 A.M.	4/26/71 9:10 A.M.	4/26/71 9:20
DIRECT PLATING:			
QUANTITY ____ 0.1 ML.			
QUANTITY 1 1.0 ML.	0	10	0
CHLORINE RESIDUAL (FIELD)	Raw	Raw	Raw
pH			
TURBIDITY			

PRESUMPTIVE TEST: 37° IN LACTOSE BROTH		7952 TUBE NO. 1	2	3	4	5		7953 TUBE NO. 1	2	3	4	5		7954 TUBE NO. 1	2	3	4	5
QUANTITY 5 TUBES 0.1 ML. - 24 HRS.		0	0	0	0	0	5	0	0	0	0	0	5	0	0	0	0	0
QUANTITY TUBES 0.1 ML. - 48 HRS.		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0
QUANTITY 5 TUBES 1.0 ML. - 24 HRS.		0	0	0	0	0	5	0	0	0	0	0	5	0	0	0	0	[illegible]
QUANTITY TUBES 1.0 ML. - 48 HRS.		0	0	0	0	0		0	0	0	0	0		0	0	0	0	0
QUANTITY 5 TUBES 10 ML. EA. - 24 HRS.		0	0	0	0	0	5	0	0	0	0	0	5	0	0	0	0	0
QUANTITY TUBES 10 ML. EA. - 48 HRS.		0	0	0	0	0		0	0	0	+	0		0	0	0	0	0

	NO. 7952	NO. 7953	NO. 7954
CONFIRMATORY BRILLIANT GREEN LACTOSE BILE BROTH, INCUBATE FOR 48 ± 3 HR. AT 35°C ± 0.5°			
COMPLETE CONFIRMATION: TYPICAL COLONIES TRANSPLATED FROM E. M. B. 37° — 48 HRS. IN BROTH.			
MEMBRANE FILTER 24 HRS. C 37° C ENDO MEDIUM			
VOLUME FILTERED			
TYPICAL COLONIES			
REMARKS ON SAMPLES:	P	P	P

COLIFORM ORGANISMS PER 100 ML.

	MULTIPLE TUBES		MEMBRANE FILTER
NO. — 7952	0	MPN	
NO. — 7953	0	MPN	
NO. — 7954	0	MPN	

ANALYZED BY ____________

AR100040

GWIN, DOBSON & FOREMAN, INC.

Consulting Engineers

EIGHTH AVENUE AND TWELFTH STREET
P. O. BOX 1589
ALTOONA, PENNSYLVANIA 16603

AREA CODE 814
943-5214
943-5215

ORIGINAL (Red)

P... YLVANIA DEPARTMENT OF HEALTH
CERTIFICATION NO. IV-9-B

FILE NO. 7955

BACTERIOLOGICAL ANALYSIS
WATER REPORT

DATE 4/26/71

Moody Drilling Co.

	NO. 7955	NO.	NO.
PLACES SAMPLES COLLECTED	E. Stroudsburg, Pa.		
POINT SAMPLES COLLECTED	Test Well #1		
DATE & HOUR SAMPLES COLLECTED	4/23/71 12:15 P.M.		
DATE & HOUR SAMPLES ANALYZED	4/26/71 9:30 A.M.		
DIRECT PLATING:			
QUANTITY ____ 0.1 ML.			
QUANTITY 1 1.0 ML.	2		
CHLORINE RESIDUAL (FIELD)	Raw		
pH			
TURBIDITY			

PRESUMPTIVE TEST:	TUBE NO.					TUBE NO.					TUBE NO.				
37° IN LACTOSE BROTH	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
QUANTITY 5 TUBES 0.1 ML. - 24 HRS.	0	0	0	0	0										
QUANTITY TUBES 0.1 ML. - 48 HRS.	0	0	0	0	0										
...NTITY 5 TUBES 1.0 ML. - 24 HRS.	0	0	0	0	0										
...ANTITY TUBES 1.0 ML. - 48 HRS.	0	0	0	0	0										
QUANTITY 5 TUBES 10 ML. EA. - 24 HRS.	0	0	0	0	0										
QUANTITY TUBES 10 ML. EA. - 48 HRS.	0	0	0	0	0										

CONFIRMATORY BRILLIANT GREEN LACTOSE BILE BROTH, INCUBATE FOR 48 ± 3 HR. AT 35°C ± 0.5°			
COMPLETE CONFIRMATION: TYPICAL COLONIES TRANSPLANTED FROM E. M. B. 37° — 48 HRS. IN BROTH.			
MEMBRANE FILTER 24 HRS. C 37° C ENDO MEDIUM			
VOLUME FILTERED			
TYPICAL COLONIES			

REMARKS ON SAMPLES: P

COLIFORM ORGANISMS PER 100 ML.

		MULTIPLE TUBES		MEMBRANE FILTER
7955	NO. —	0	MPN	
	NO. —		MPN	
	NO. —		MPN	

ANALYZED BY ____________

AR100041

ORIGINAL
(Red)

APPENDIX III

CYRUS WM
RICE
DIVISION
NUS CORPORATION

Bill -> file

ORIGINAL
(Red)

MANOR OAK TWO
1910 COCHRAN ROAD
PITTSBURGH, PA. 15220
412-343-9200

June 22, 1971

Client No. 6213.01

Mr. Richard E. Wright, Manager
Harrisburg Branch Office
Moody and Associates, Inc.
4099 Derry Street
Harrisburg, Pennsylvania 17111

SUBJECT: COMPATIBILITY OF WELL WATER WITH TREATED SURFACE SUPPLY AT EAST STROUDSBURG, PENNSYLVANIA

Dear Mr. Wright:

As you requested, we have analyzed the water samples from East Stroudsburg submitted May 26, 1971 by William L. Hopkins, Jr. of Edward C. Hess Associates, Inc. and have reviewed the various reports describing the history of the borough's water supply, its treatment, and the problems of iron content, turbidity, taste and color with which it has been plagued.

The attached analyses, Rice Samples Nos. 60056 to 60059, describe the quality of the waters from the indicated sources. The raw water is highly corrosive due to its low alkalinity and hardness which produce a very negative Langelier Index of -2.8 to -3.1 depending upon the temperature. It has very high iron, manganese, color, and turbidity content, making it unusable as a municipal supply without treatment.

After treatment at the filter plant effluent the water is greatly improved in terms of the essential removal of color, turbidity, iron, and manganese. However, its pH and alkalinity are still low enough to cause a negative Langelier Index of -0.8 to -1.1 which indicates a significantly corrosive water with ferrous construction materials. This water could easily corrode unprotected steel piping or remove old iron oxide deposits at a slow rate to cause red, cloudy water.

The treated water from the Field House area, I presume, is sampled from a point in the distribution grid somewhat distant from the treatment plant. This sample shows a slightly higher

ORIGINAL (Red)

suspended iron content than that at the supply point. It has also dropped considerable calcium and alkalinity in its travel through the grid. As a result, it has become still more corrosive, with a significantly negative Langelier Index of -1.8 to -2.1.

The well water is of acceptable quality for drinking water on all counts from the physical and chemical characteristic standpoint. I presume you have established its acceptability with regard to bacteriological quality. This analysis shows the quality to be marginal in some respects, however. For example, its turbidity is 4.5 JTU versus an acceptable 5.0 JTU, its total iron content is 0.187 ppm versus an acceptable maximum of 0.3 ppm, and its nitrate is high 42.8 ppm versus an acceptable maximum of 45 ppm.

The well water itself has a nearly neutral Langelier Index of -0.1 to -0.3 which indicates stable conditions, neither depositing or corrosive. However, if the pH of this water were raised to 8.3 by blending it with the existing treatment plant effluent, its Index would become somewhat positive or tending toward deposition, simultaneously fixing the free CO_2 as carbonate alkalinity. The actual effect is totally dependent upon the quantitative blend projected. It is entirely possible that such a blend could cause a neutral Index for the combined water, balancing the positive alkalinity and hardness of the well water against the negative low alkalinity, hardness, and pH of the treatment plant water.

Such blending would also reduce to very acceptable levels the slightly excessive iron, turbidity, and nitrate of the well water. This effect would constitute an improvement of the well water by the blending-in of the treated surface water. However, the well water would improve the treated water quality by adding natural alkalinity and hardness to make the blend less corrosive and reduce the requirement for post-pH adjustment lime feed at the filter plant. Any calcium deposition it might cause in the distribution grid would be a protective coating on the mains similar in effect to a continuous calcite treatment.

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In summary, I see no reason to question the compatibility of the two water supplies or the ability to use either as a sole source of supply.

Thank you for the opportunity to submit this opinion.

Very truly yours,

David E. Simon, II

David E. Simon, II, P.E.
Senior Technical Associate

DES/jr

Attachments

CYRUS WM RICE DIVISION
NUS CORPORATION

ORIGINAL (Red)

LABORATORIES
15 NOBLE AVENUE
PITTSBURGH, PA. 15205
412-922-2300

WATER ANALYSIS

Moody and Associates, Inc.

Client No. Q
Date Sampled
Date Received
Date Reported June 14, 1971

Sample Source Raw Water at Treatment Plant
Rice Sample No. 60056
Client Sample No.

DETERMINATION*	RICE	CLIENT
Pht. Alkalinity ($CaCO_3$)	0	
M.O. Alkalinity ($CaCO_3$)	16	
Free Acidity ($CaCO_3$)		
Total Acidity ($CaCO_3$)		
Bicarbonate ~~XXXX~~ ($CaCO_3$)	16	
Carbonate (CO_3)	0	
Hydroxide (OH)		
Chloride (Cl)	29	
Chloride (NaCl)		
Sp. Conductance (25 °C) mmhos.	54	
pH	6.7	
Color (APHA)	>70	
Turbidity (J.T.U.)	97	
Calcium (Ca)	5	
Magnesium (Mg)		
Hardness Total ($CaCO_3$)	12.8	
Phosphate Total (PO_4)		
Phosphate Ortho (PO_4)		
Phosphate Poly (PO_4)		
Sodium (Na)		
Potassium (K)		
Silica Soluble (SiO_2)		
Silica Total (SiO_2)		
Sulfate (SO_4)	2	
Sulfite (SO_3)		
Sulfide (S)		
Iron Soluble (Fe)	0.087	
Iron Total (Fe)	8.8	
Iron Ferrous (Fe)		
Nitrate (NO_3)	5.2	
Nitrite (NO_2)	0.38	
Free Carbon Dioxide		
(ppm CO_2 Calculated)	6.4	

DETERMINATION*	RICE	CLIENT
Total Matter	140	
Suspended Matter	90	
Dissolved Matter	50	
Settleable Matter		
Nonsettleable Matter		
Volatile Matter		
Solvent Extract. Matter		
Oily Matter (by I.R.)		
Odor		
Phenol (C_6H_5OH)		
Surfactant (ABS)		
Chem. Oxygen Demand (O_2)		
Bio. Oxygen Demand (O_2)		
Fluoride (F)		
Ammonia (NH_3)		
Nitrogen, Kjeldahl (N)		
Aluminum Total (Al)		
Chromium Total (Cr)		
Chromium (Cr^{+6})		
Chromate (CrO_4)		
Cyanide Total (CN)		
Cyanide Free (CN)		
Copper (Cu)		
Manganese (Mn)	1.8	
Cadmium (Cd)		
Nickel (Ni)		
Zinc (Zn)		
Lead (Pb)		
Tin (Sn)		
Chelants		
pH_s @ 50°F (Calculated)	9.8	
pH_s @ 60°F (Calculated)	9.7	
pH_s @ 70°F (Calculated)	9.5	

Test results reported in ppm unless otherwise noted.

Special Instructions (Methods, Etc.)

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PITTSBURGH, PA. 15205
412-922-2300

ORIGINAL (Red)

Moody and Associates, Inc.

WATER ANALYSIS

Client No. Q
Date Sampled
Date Received
Date Reported June 14, 1971

Sample Source Municipal Treatment Plant Effluent
Rice Sample No. 60057
Client Sample No.

DETERMINATION*	RICE	CLIENT
Pht. Alkalinity ($CaCO_3$)	0	
M.O. Alkalinity ($CaCO_3$)	16	
Free Acidity ($CaCO_3$)		
Total Acidity ($CaCO_3$)		
Bicarbonate (~~HCO₃~~ ($CaCO_3$)	16	
Carbonate (CO_3)	0	
Hydroxide (OH)		
Chloride (Cl)	4	
Chloride (NaCl)		
Sp. Conductance (25°C) mmhos.	108	
pH	8.3	
Color (APHA)	10	
Turbidity (J.T.U.)	.67	
Calcium (Ca)	14	
Magnesium (Mg)		
Hardness Total ($CaCO_3$)	36	
Phosphate Total (PO_4)		
Phosphate Ortho (PO_4)		
Phosphate Poly (PO_4)		
Sodium (Na)		
Potassium (K)		
Silica Soluble (SiO_2)		
Silica Total (SiO_2)		
Sulfate (SO_4)	20	
Sulfite (SO_3)		
Sulfide (S)		
Iron Soluble (Fe)	0.004	
Iron Total (Fe)	<0.05	
Iron Ferrous (Fe)		
Nitrate (NO_3)	<0.2	
Nitrite (NO_2)	<0.01	
Free Carbon Dioxide		
(ppm CO_2 Calculated)	0.0	

DETERMINATION*	RICE	CLIENT
Total Matter	82	
Suspended Matter	10	
Dissolved Matter	72	
Settleable Matter		
Nonsettleable Matter		
Volatile Matter		
Solvent Extract. Matte		
Oily Matter (by I.R.)		
Odor		
Phenol (C_6H_5OH)		
Surfactant (ABS)		
Chem. Oxygen Demand (O_2)		
Bio. Oxygen Demand (O_2)		
Fluoride (F)		
Ammonia (NH_3)		
Nitrogen, Kjeldahl (N)		
Aluminum Total (Al)		
Chromium Total (Cr)		
Chromium (Cr^{+6})		
Chromate (CrO_4)		
Cyanide Total (CN)		
Cyanide Free (CN)		
Copper (Cu)		
Manganese (Mn)	0.03	
Cadmium (Cd)		
Nickel (Ni)		
Zinc (Zn)		
Lead (Pb)		
Tin (Sn)		
Chelants		
pH_s @ 50°F (Calculated)	9.4	
pH_s @ 60°F (Calculated)	9.2	
pH_s @ 70°F (Calculated)	9.1	

Test results reported in ppm unless otherwise noted.

Special Instructions (Methods, Etc.)

AR100047

CYRUS WM RICE DIVISION
NUS CORPORATION

LABORATORIES
15 NOBLE AVENUE
PITTSBURGH, PA. 15205
412-922-2300

ORIGINAL (Red)

Moody and Associates, Inc.

WATER ANALYSIS

Client No. O
Date Sampled
Date Received
Date Reported June 14, 1971

Sample Source Tap Near Well in System East Stroudsburg Field House

Rice Sample No. 60058
Client Sample No.

DETERMINATION*	RICE	CLIENT
Pht. Alkalinity ($CaCO_3$)	0	
M.O. Alkalinity ($CaCO_3$)	6	
Free Acidity ($CaCO_3$)		
Total Acidity ($CaCO_3$)		
Bicarbonate (~~HCO_3~~ ($CaCO_3$)	6	
Carbonate (CO_3)	0	
Hydroxide (OH)		
Chloride (Cl)	7.2	
Chloride (NaCl)		
Sp. Conductance (25 °C) mmhos.	96	
pH	8.1	
Color (APHA)	5	
Turbidity (J.T.U.)	7	
Calcium (Ca)	5.7	
Magnesium (Mg)	16	
Hardness Total ($CaCO_3$)		
Phosphate Total (PO_4)		
Phosphate Ortho (PO_4)		
Phosphate Poly (PO_4)		
Sodium (Na)		
Potassium (K)		
Silica Soluble (SiO_2)		
Silica Total (SiO_2)		
Sulfate (SO_4)	13	
Sulfite (SO_3)		
Sulfide (S)		
Iron Soluble (Fe)	<0.001	
Iron Total (Fe)	0.05	
Iron Ferrous (Fe)		
Nitrate (NO_3)	<0.2	
Nitrite (NO_2)	<0.01	
Free Carbon Dioxide		
(ppm CO_2 Calculated)	0.75	

DETERMINATION*	RICE	CLIENT
Total Matter	90	
Suspended Matter	14	
Dissolved Matter	76	
Settleable Matter		
Nonsettleable Matter		
Volatile Matter		
Solvent Extract. Matter		
Oily Matter (by I.R.)		
Odor		
Phenol (C_6H_5OH)		
Surfactant (ABS)		
Chem. Oxygen Demand (O_2)		
Bio. Oxygen Demand (O_2)		
Fluoride (F)		
Ammonia (NH_3)		
Nitrogen, Kjeldahl (N)		
Aluminum Total (Al)		
Chromium Total (Cr)		
Chromium (Cr^{+6})		
Chromate (CrO_4)		
Cyanide Total (CN)		
Cyanide Free (CN)		
Copper (Cu)		
Manganese (Mn)	0.04	
Cadmium (Cd)		
Nickel (Ni)		
Zinc (Zn)		
Lead (Pb)		
Tin (Sn)		
Chelants		
pH_s @ 50°F (Calculated)	10.2	
pH_s @ 60°F (Calculated)	10.1	
pH_s @ 70°F (Calculated)	9.9	

Test results reported in ppm unless otherwise noted.

*Special Instructions (Methods, Etc.)

AR100048

CYRUS WM RICE DIVISION
NUS CORPORATION

LABORATORIES
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PITTSBURGH, PA. 15205
412-922-2300

ORIGINAL (Red)

WATER ANALYSIS

Moody and Associates, Inc.

Client No. Q
Date Sampled
Date Received
Date Reported June 14, 1971

Sample Source Well Water

Rice Sample No. 60059
Client Sample No.

DETERMINATION*	RICE	CLIENT
Pht. Alkalinity ($CaCO_3$)	0	
M.O. Alkalinity ($CaCO_3$)	200	
Free Acidity ($CaCO_3$)		
Total Acidity ($CaCO_3$)		
Bicarbonate (~~HCO_3~~) ($CaCO_3$)	200	
Carbonate (CO_3)	0	
Hydroxide (OH)		
Chloride (Cl)	8.4	
Chloride (NaCl)		
Sp. Conductance (25 °C) mmhos.	572	
pH	7.3	
Color (APHA)	5	
Turbidity (J.T.U.)	4.5	
Calcium (Ca)	73	
Magnesium (Mg)		
Hardness Total ($CaCO_3$)	256	
Phosphate Total (PO_4)		
Phosphate Ortho (PO_4)		
Phosphate Poly (PO_4)		
Sodium (Na)		
Potassium (K)		
Silica Soluble (SiO_2)		
Silica Total (SiO_2)		
Sulfate (SO_4)	16	
Sulfite (SO_3)		
Sulfide (S)		
Iron Soluble (Fe)	0.020	
Iron Total (Fe)	0.187	
Iron Ferrous (Fe)		
Nitrate (NO_3)	42.8	
Nitrite (NO_2)	0.018	
Free Carbon Dioxide		
(ppm CO_2 Calculated)	19.4	

DETERMINATION*	RICE	CLIENT
Total Matter	340	
Suspended Matter	14	
Dissolved Matter	326	
Settleable Matter		
Nonsettleable Matter		
Volatile Matter		
Solvent Extract. Matter		
Oily Matter (by I.R.)		
Odor		
Phenol (C_6H_5OH)		
Surfactant (ABS)		
Chem. Oxygen Demand (O_2)		
Bio. Oxygen Demand (O_2)		
Fluoride (F)		
Ammonia (NH_3)		
Nitrogen, Kjeldahl (N)		
Aluminum Total (Al)		
Chromium Total (Cr)		
Chromium (Cr^{+6})		
Chromate (CrO_4)		
Cyanide Total (CN)		
Cyanide Free (CN)		
Copper (Cu)		
Manganese (Mn)	<0.02	
Cadmium (Cd)		
Nickel (Ni)		
Zinc (Zn)		
Lead (Pb)		
Tin (Sn)		
Chelants		
pH_s @ 50°F (Calculated)	7.6	
pH_s @ 60°F (Calculated)	7.5	
pH_s @ 70°F (Calculated)	7.4	

Test results reported in ppm unless otherwise noted.

Special Instructions (Methods, Etc.)

AR100049